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Proceedings of the Maritime Provinces Regional Advisory Process Assessment for Gaspereau River Alewife

26 March 2007
Bedford Institute of Oceanography
Dartmouth, Nova Scotia

Paul Boudreau
Meeting Chair

Bedford Institute of Oceanography
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June 2007

Compte rendu du Processus consultatif régional des provinces Maritimes sur l'évaluation de la population de gaspareau de la rivière Gaspereau

Le 26 mars 2007
Institut océanographique de Bedford
Dartmouth (Nouvelle-Écosse)

Paul Boudreau
Président de réunion

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Canada

Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings include research recommendations, uncertainties, and the rationale for decisions made by the meeting. Proceedings also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

Avant-propos

Le présent compte rendu a pour but de documenter les principales activités et discussions qui ont eu lieu au cours de la réunion. Il contient des recommandations sur les recherches à effectuer, traite des incertitudes et expose les motifs ayant mené à la prise de décisions pendant la réunion. En outre, il fait état de données, d'analyses ou d'interprétations passées en revue et rejetées pour des raisons scientifiques, en donnant la raison du rejet. Bien que les interprétations et les opinions contenus dans le présent rapport puissent être inexacts ou propres à induire en erreur, ils sont quand même reproduits aussi fidèlement que possible afin de refléter les échanges tenus au cours de la réunion. Ainsi, aucune partie de ce rapport ne doit être considéré en tant que reflet des conclusions de la réunion, à moins d'indication précise en ce sens. De plus, un examen ultérieur de la question pourrait entraîner des changements aux conclusions, notamment si l'information supplémentaire pertinente, non disponible au moment de la réunion, est fournie par la suite. Finalement, dans les rares cas où des opinions divergentes sont exprimées officiellement, celles-ci sont également consignées dans les annexes du compte rendu.

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SUMMARY

A one-day meeting was held in the Maritimes Region on 26 March 2007. The purpose was to review the scientific advice on the population status of the Gaspereau River alewife between 2002 and 2007, and to provide advice to the Department of Fisheries and Oceans (DFO) Fisheries and Aquaculture Management Branch on the potential impacts of measures to be considered in the establishment of the next five-year management plan.

These proceedings document the presentations, and record discussion and recommendations, along with the terms of reference, agenda, and participants of the meeting.

SOMMAIRE

Une réunion d'une journée a eu lieu, dans la Région des Maritimes, le 26 mars 2007. Elle avait pour but d'examiner les avis scientifiques sur la population de gaspareau de la rivière Gaspereau entre 2002 et 2007, et de donner des avis à la Direction de la gestion des pêches et de l'aquaculture du ministère des Pêches et des Océans (MPO), sur les conséquences possibles des mesures envisagées pour le prochain plan de gestion quinquennal.

Le présent compte rendu fait état des exposés, des discussions et des recommandations auxquels cette réunion a donné lieu et inclut les modalités et l'ordre du jour de la réunion, ainsi que la liste des participants.

INTRODUCTION

The alewife fishery on the Gaspereau River has been managed for the past five years based primarily on restrictions of fishing activities to a specific open season within the year, restrictions on the number of days per week that fishing is permitted during the open season, and restrictions on the type of gear, as well as the number of licenses. In 2002, at the start of the most recent management plan, the number of open days per week was decreased from five days to four, to reduce the exploitation rate and increase spawning escapement. Also at that time, steps were taken to improve fish passage within the river system. In support of the new five-year fish management plan, Maritimes Region, Fisheries and Aquaculture Management Branch has requested an assessment of stock status. Of particular interest, are any observed impacts on the stock status resulting from the changes in exploitation and/or fish passage since the last assessment. The meeting undertook the scientific review of the assessment, including estimates of exploitation rates and spawning escapement for the years 2002 to 2006.

The Chair, Paul Boudreau, opened proceedings by welcoming the participants (Appendix 1) and, in particular, the external reviewer, Dr. Kurtis Trzcinski. The context and overall process of the assessment review, as outlined in the Terms of Reference (Appendix 2) were then presented. The Agenda (Appendix 3) was reviewed and accepted. The Chair noted that the working paper, which was made available to participants about one-week before the meeting, was also available at the back of the room.

These proceedings provide brief summaries of presentations and discussions of the participants at the meeting.

After thanking Shane O'Neil, the meeting rapporteur, the presentation of the working papers commenced.

SUMMARY OF PRESENTATIONS

McIntyre, T.M., R.G. Bradford, T.D. Davies, and A.J.F. Gibson. 2007. Gaspereau River Alewife Stock Status for the Years 2001 to 2006. RAP Working Paper 2007/16.

Two presentations on this paper were given:

- T. Davies presented the issue and analysis related to the estimation of the number of fish ascending the fish ladder at White Rock, and
- T. McIntyre presented the status of alewife for the years 2001 to 2006.

Assess the Status of the Alewife Population on the Gaspereau River, Nova Scotia, Using the Following Indicators

Presentation Highlights

Abundance

It was noted that the stock in the Gaspereau River is almost exclusively alewife, with only a very small number of blueback herring contributing to the fishery.

Abundance, represented by the total number of fish in the run, is estimated by adding the estimates of the number of fish caught in the fisheries with the number of fish estimated to pass through the counting facility at the White Rock Fishway. The estimated run size in the 2002 to 2006 time period, averaged 576,000 individuals. This is thought to be a conservative estimate because it does not include the estimates of the number of fish moving on days when the camera was not operating. Some interpolation methods to account for the missing days were presented, and their results suggest that the effect of the missing days is not large (see below), but there is no data to know exactly how many fish were moving on those days. The 2001 data was not included when calculating the mean because it was influenced by extreme spring high water and flooding conditions that dramatically affected the catch in that year.

Escapement

The spawning escapement was estimated as the number of alewife that move upstream through the White Rock Fishway. There have been a number of changes and improvements to the fishway facility through its time of operation that make it difficult to compare escapement through time. The presentation focused on recent improvements in using video camera equipment to automatically record the movement of fish through the fishway and to reduce the amount of effort required to get an estimate of escapement. An important factor in the estimation of total escapement is the analytical method of estimating the total number of fish passed from the numbers observed. The total number would include estimates of fish passed during periods of time where the equipment was not counting fish, for example, in the event of equipment malfunction, as has been experienced in the past. The largest adjustment that has been required so far was for the 2003 data that resulted in a 15% increase from the non-interpolated values. For the 2006 data, the adjustment was only 1%.

Based on the non-interpolated values, escapement between 2002 and 2006 averaged 279,000 fish, ranging from 149,000 fish in 2004 to 379,511 fishing in 2003. The interpolated values are slightly higher.

Exploitation Rate

Exploitation rate information was presented for the commercial catch from the square net traps, fixed gillnet, and drift gillnet fisheries. Reported catches from the square net fishery were increased by 250 pails in an attempt to adjust for the unmeasured recreational catch. With the catch estimates ranging from 219,000 to 416,000 fish between 2002 and 2006, this correction is very small, on the order of 7 to 13%. It was noted that the exploitation rate in 2001 was low because of high water conditions that precluded fishing during portions of the season.

Although there is a recreational river fishery and an estuarine gillnet fishery, they are not believed to contribute significantly to the total annual harvest relative to the commercial square net fishery.

Using estimates of escapement that include the interpolation, exploitation rates for the 2002 to 2006 period ranged between 45 and 61% with an average of 54%.

Biological Characteristics

Over the time period with data, the mean fork length and mean weight have not differed significantly. Neither mean age nor maximum age has increased since the new one additional day-per-week closure was put in place in 2002. Mean age at first spawning and mean age of

repeat spawners have remained the same over time and continue to indicate that spawning depends primarily upon the four- and five-year old age classes. The percent of repeat spawners is variable with time and there is no observed trend in the proportional increase in repeat spawners since the new management plan.

Discussion

There was considerable discussion on the procedures for estimating escapement. In regards to the use of the automated counting system with video observations, it was suggested that a correlation between hand counts and video should be done to clearly estimate the accuracy of the video methodology. Although this was done for a sample in 2002, it was not presented for review, but the results suggested the camera worked well. The authors were cautioned not to state that video counts were actually better than hand counts without more data to substantiate the claim.

In regards to the estimate of escapement, the authors noted that since the "missing count data" interpolation approach was not peer reviewed prior to the meeting, the estimated counts for the missing days were not used in the escapement estimates provided in the working paper. It was accepted that an interpolation of numbers observed at the fishway was necessary to scale up the observed numbers to a more realistic estimate of the total number, thus accounting for periods with no counts.

A number of suggestions were made that might improve interpolations in the future. These included:

- The authors may wish to consider looking at other approaches such as using the median, or use of a covariate, to weight the "interpolated" value such as temperature, run size by day, etc. A recommendation was made that in the future, use of run timing within the day in the old fishway and in the new fishway could be summarized and included in a table or graph to clarify those patterns; this could be useful for future review of how daily run timing might influence the interpolation of counts. A caution was raised that run timing appeared to be different in the new and old fishways. There has been only limited success in developing a model for the old fishway to examine whether environmental co-variates could be used to predict counts.

- One could look at the "missed count days" and note whether they occurred when the fishery was open or closed (i.e., weekly closed times). It was pointed out that the amount of catch downstream had been used to adjust the estimate of escapement when the old fishway was in place, but depending on time lags involved, it is uncertain if this could be usefully applied in conjunction with the operation of the new fishway.

Although the application of these suggestions these might improve the estimates of escapement, it was not felt necessary to incorporate them in this assessment.

It was clarified that there was no measure of interpolation error in the present analysis.

The graph presented showing the proportion of the count occurring each day with the overlying count estimate at the fishway would be a useful addition to the research document. This would be valuable to include for other years as well.

It was noted that the high numbers counted on some days far exceeded the highest daily counts at the old fishway. This was explained as due to the increased capacity of the new fishway which has had numerous daily counts far higher than prior to the fishway improvements. Reduced exploitation would also have helped give rise to the observation of increasing daily counts.

The high count noted for 2004 during the June 9th-11th period, might be partly due to an extension in the fishery to June 7th of that year. The higher counts occurred just after the fishery closed.

It would be useful to have information on the age structure of the catch versus the escapement that would provide an understanding of the possible selective effects of the fishery. There may be difference in the selectivity of the gillnet fishery versus the square nets which may not have a high degree of selectivity, although the catch taken in gillnet fishery is relatively small. Selectivity could also occur as a result of run timing as the commercial fishery is focused on the first part of the run.

The question was raised about how the recent exploitation rates compared with reference points for alewife. It was pointed out that Gibson and Myers (2003) calculated many possible reference points for alewife fisheries. For the Gaspereau River, the exploitation rate at maximum sustainable yield (MSY) was estimated to be 63%. If uncertainty is taken into account, the average catch is maximized at a rate of 56%. They found that 90% of MSY could be obtained by fishing at a rate of 41%. Recent exploitation rates, from 46.1% to 64.3% for the years 2002 to 2006, are above the level thought to produce 90% MSY, but below the rates thought to represent MSY.

Concern was expressed that due to the elimination in future years of pail counts as an estimate of the total catch, it may be difficult to be assured of adequate information for the assessment. Historically estimates were based on two methods; pail counts and logbooks. Future assessments will have to rely solely on fishers' logbooks which, to date, have been returned at a relatively low rate, only 60-70% in several years.

There were numerous questions regarding the exact details of estimating catch. These include:

- How to appropriately estimate the number of fish per pail;
- How the count of pails were conducted;
- How reliable is the logbook reporting; and
- What was the basis for the scaling of the square trap catch up to an estimate that might reflect the total commercial catch including gillnets.

It was agreed that although there were a number of uncertainties in the estimate, the historical record was sufficient to follow the general trends in the population and the fishery over time. There is a need to ensure adequate log book information for future assessments.

The data summaries didn't show an effort estimate for the fishery over the years. It would be a useful addition to include both number of active licensees by year, as well of days operating, if available.

Fishermen representatives stated that they would prefer to report in pounds of catch, but would canvas other fishermen to improve reporting rates. Science has requested a count of fish or a report in kilograms so this will have to be addressed in future.

Evaluate the Effectiveness of the Weekly Closures on Stock Abundance and Exploitation Rate

Presentation Highlights

The estimated run size in the 2002 to 2006 time period averaged 576,000 individuals. In comparison, the average run size was estimated to be 721,000 individuals for the years 1997 to 2000 just prior to the start of the new management plan, indicating an ongoing decline. Data for 2001 was excluded in this comparison because it was influenced by high water and flooding conditions.

Although run size has decreased, spawning escapement has increased. Escapement between 2002 and 2006 averaged 279,000 compared with 111,000 for the earlier 1997 to 2000 period.

Exploitation rates have also decreased. Exploitation is estimated to have ranged from 46.1% to 64.3% between 2002 and 2006, whereas from 1997 to 2000 exploitation rates ranged from 68.5% to 89.6%.

Discussion

It was pointed out that many conservation biologists and organizations such as the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) are calculating rates of decline for other species in an effort to identify those that require attention. Initial analysis here showed a 79% decline in estimated run size of alewife from 1995 to 2006. This calculation needs to be double checked. If this calculation is correct, it may be a reason for concern. This is especially relevant because of the general decline in alewife numbers across the Maritimes Region.

The point was made that the long-term trend was not promising as there has been a slower than anticipated response of the population to the reduction in exploitation. Nevertheless, with the achieved reduction in exploitation rate, the recent trend did show an increase in escapement that might eventually lead to an increase in population numbers and recruitment. To date, any increases in recruitment due to the changes in management would only be expected in 2006, so it is still early to be evaluating the impact of the plan.

It was suggested that the numbers-at-age table could be indicating a decrease in survival rate and appears paradoxical given that the management plan was meant to increase recruitment. A table of survivorship would show this and reflect repeat spawners.

There was concern expressed that the sampling rate for age at the fishway was relatively low given the size of the run and the numbers-at-age structure of the population without any explanation of the statistical robustness of the sample rate.

It was pointed out that the annual numbers-at-age showed that of the 200,000 four-year old fish estimated from 2005, only 20,000 five-year old fish were estimated to have returned in 2006. This ratio is similar to other years and illustrates that most fish recruit at age four. The number of age four maiden fish in 2006 was low relative to other years, despite being the first year when

recruitment would be expected to have increased due to the management plan. It was noted that this could be reflective of poor recruitment and should be followed up in 2007 through monitoring of five-year olds. Recruitment is highly variable in alewife, and further monitoring will be required to see if recruitment will increase in the next few years.

A question was asked about the survival of downstream migrating adult and juvenile alewives. No information is available about these rates. It is impossible to determine if the low number of four-year olds returning to the river is due to mortalities in the river, estuary, or at sea.

General Discussion

In general, it was pointed out that there have been many changes to this river system that might have affected the parameters being evaluated and some of these could be described more clearly. These include, fish way construction and upgrades, changes in fish management actions, and the extension of the fishing period due to flood conditions. It was agreed that it would be useful to compile all of these changes, and their timing, into a single figure or table representing the timeline of changes, as this might allow for better interpretation of observed changes in the fisheries parameters. Related to this timeline, it should include the management of the water on the Gaspereau River system and a description of the changes in the hydroelectric system since 2000.

In general, there is a desire by some stakeholders to include the broader fish community in management of the river system. For this river system there are other diadromous species that make use of the habitat, such as shad, eels, smelt, and salmon. There was a question raised about the possible impacts of water management for alewife on these other species. There may be tradeoffs of the impacts of decisions for alewife management and possible actions in regards to other species. It was mentioned that there would be a benefit in developing reference points for all species, not just alewife. It was noted that due to the proximity to, and interest in, the river system information from local stakeholders is a valuable contribution to the assessment of the stock.

RESEARCH RECOMMENDATIONS

- Need to study the transition from estimating catch from pail counts to estimating catch solely from logbooks.
- Need to compare the age in the catch with the age distribution passing through the fish ladder.
- Should check to see if there is a relationship between water temperature and numbers of fish passing through the fishway?
- Should check for lag-one autocorrelation in temporal datasets.
- Should investigate impact of fisheries operation on escapement if interpolation methodologies are to be continued.
- Should carry out a sensitivity analysis to investigate appropriate level of sampling at the fishway to adequately describe age distribution of escapees.

CONCLUDING REMARKS

The Chair reviewed the process to be followed for the remainder of the assessment framework review. The proceedings will be circulated for comment by all participants. The Science Advisory Report (SAR) will include the bullets agreed to at the meeting and will be reviewed by a editorial board before posting on the Canadian Science Advisory Secretariat (CSAS) website.

The Chair then thanked all the participants and closed the meeting.

REFERENCES

Gibson, A.J.F., and R.A. Myers. 2003. Biological Reference Points for Anadromous Alewife (*Alosa pheudoharengus*) Fisheries in the Maritime Provinces. Can. Tech. Rep. Fish. Aquat. Sci. No . 2468: 50p.

McIntyre, T.M., R.G. Bradford, T.D. Davies, and A.J.F. Gibson. 2007. Gaspereau River Alewife Stock Status for the Years 2001 to 2006. RAP Working Paper 2007/16.

Appendix 1. List of Participants

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Appendix 2. Terms of Reference

Science Advisory Process on Assessment for Gaspereau River Alewife

26 March 2007

George Needler Boardroom
Bedford Institute of Oceanography
1 Challenger Drive
Dartmouth, Nova Scotia

TERMS OF REFERENCE

Context

The alewife fishery on the Gaspereau River has been managed for the past five years based on weekly closures. In 2002, at the start of the most recent management plan, the number of daily closures was increased from two days a week to three days a week within the fishing season to reduce the exploitation rate and increase escapement. Also at that time, steps were taken to improve fish passage within the river system. In support of a new the five-year fish management plan, DFO Maritimes Fisheries and Aquaculture Management has requested an assessment of stock status. Of particular interest, are any observed impacts on the stock status resulting from the changes in number of daily closures and/or the improved fish passage since the last assessment. The meeting will undertake the scientific review of the assessment and estimates of stock status for the next five years.

Objectives

- Assess the status of alewife populations on the Gaspereau River, Nova Scotia, using the following indicators:
    - Abundance
    - Escapement
    - Exploitation Rate
    - Biological Characteristics
- Evaluate the effectiveness of the weekly closures on stock abundance and exploitation rate.

Outputs

CSAS Science Advisory Report for Alewife
CSAS Proceedings summarizing the discussion
CSAS Working Paper/Research Document

Participation

DFO Science Maritimes Regions
DFO Maritimes Fisheries and Aquaculture Management
DFO Maritimes Habitat Protection and Sustainable Development
Fisheries Advisory Council Members
External reviewers

Appendix 3. Agenda

Science Advisory Process on Assessment for Gaspereau River Alewife

26 March 2007

George Needler Boardroom
Bedford Institute of Oceanography
1 Challenger Drive
Dartmouth, Nova Scotia

AGENDA

26 March 2007 - Monday

10:00–10:15	Welcome and Introduction (Chair)
10:15–10:30	The Fishery (Tara McIntyre)
10:30–11:30	Escapement Count Methodology (Trevor Davies)
11:30–12:00	The Stock Status (Tara McIntyre)
12:00–13:00	Lunch
13:00–13:30	The Stock Status – continued (Tara McIntyre)
13:30–15:00	Review of Stock Advisory Report (Chair)
15:00–15:15	Health Break
15:15–16:30	Continue Review of Stock Advisory Report (Chair)
15:15–16:30	Wrap up and closure (Chair)